

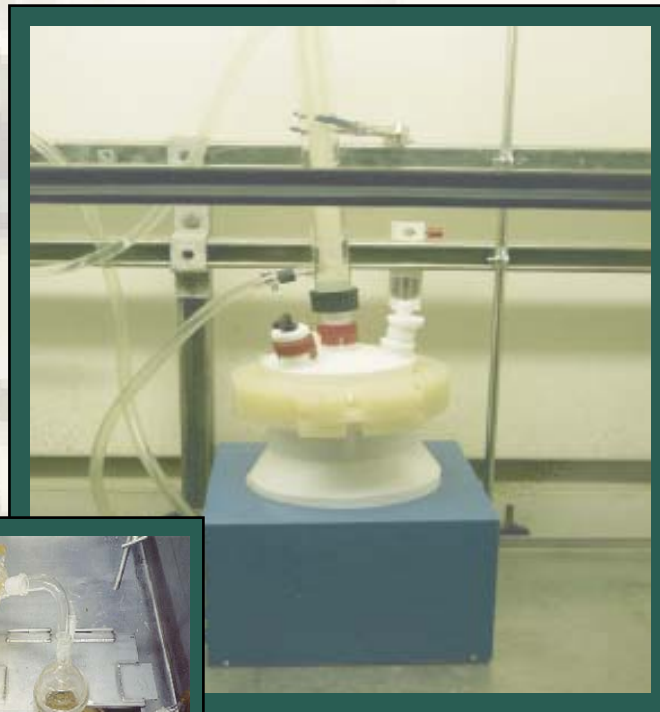
Efficiency of Plutonium Oxide Dissolution

Nuclear Materials Technology Division

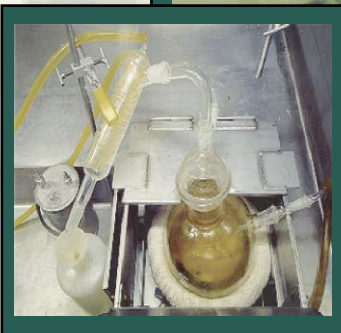
Dissolution of PuO_2 is an integral part of the hydrometallurgy for recycling plutonium oxide and treatment of Pu waste. Currently the efficiency of dissolution is about 80%. The 20% remaining in the solid phase is either recycled or becomes TRU waste. Both scenarios are costly but unavoidable.

We are working to improve dissolution of PuO_2 with the specific goal of obtaining the dissolution equivalent of two cycles in one cycle, thereby reducing operating costs by 50% and reducing annual solid waste generation by 80% with concomitant reductions in glove-box and liquid waste.

The immediate benefit will be a cost reduction in processing PuO_2 at TA-55. By increasing the dissolution, the need for recycling is diminished, resulting in lower operating costs, lower worker exposure and less TRU waste and contaminated glove-box trash. Benefits of modifying this process will continue to pay off in future years.



New Teflon Dissolver Flasks



Old Teflon Dissolver Flasks

Inherent risks are present in plutonium handling. All work is being performed under SOPs currently being used in PF4. All personnel will be fully trained to NMT requirements. In this way all safety and compliance issues will be met. Currently the lay out of the glove-box has been designed and fabrication is underway of equipment to be used. Installation will be completed by the end of July.

Experiments will be performed using new Teflon flasks in place of older glass flasks because with glass flasks there is interaction between glass and solution. Preliminary experimentation suggests that pretreatment may be effective. Pretreatment may vary from a room temperature soak to a more aggressive process at high temperature. Pretreatment steps aim at changing the crystal size and surface structure of the dioxide and include ultrasonic treatment since high-fired PuO_2 ($>750^\circ\text{C}$) forms large octahedral crystals. Shattering these crystals may enhance reactivity. Another approach is the slow addition of HF over the entire duration of the dissolution operation.

Contacts: Caroline (Cas) Mason, (505) 665-2422, cmason@lanl.gov, Team Leader, Russian Programs, NMT-15, Nuclear Materials Technology Division
 Kent Abney, (505) 665-3894, Abney@lanl.gov, Team Leader, Aqueous Processing, NMT-2, Nuclear Materials Technology Division

